THE INVENTION CLAIMED

1. Polyimide having a glass transition temperature (Tg) ranging up to about 300° C, high thermal-oxidative stability and decomposition-stability temperatures as high as 350°C derived from the photochemical cyclopolymerization of approximately stoichiometric amounts of an aromatic ketone and at least one dienophile; said polyimide having a repeating unit of a formula selected from the group consisting of:

(a)

(b)

(c)

(d)

(f)

(g)

wherein Ar in the repeating unit is the same or a different aromatic or substituted aromatic radical, R is selected from the group consisting of hydrogen, heteroaryl radicals, and lower alkyl radicals of 1 to 8 carbons, X is selected from the group consisting of nil, oxygen, sulfur, -C=O, -CH₂, alkyl radicals of 1 to 8 carbons, ether radicals, ester radicals, and aryl radicals, and Y is selected from the group consisting of nil, oxygen, -CH₂, -C=O, SO₂, ether radicals, ester radicals, polyether radicals, polyester radicals, aromatic radicals, and alkyl radicals.

2. The polyimide of Claim 1 wherein the repeating unit has the formula:

(b)

R
OH
Ar
OH
Ar
OH

(c)

5. The polyimide of Claim 1 wherein the repeating unit has the formula:

(d)

(e)

7. The polyimide of Claim 1 wherein the repeating unit has the formula:

(f)

(g)

9. The polyimide of Claim 2 wherein the ketone has the formula:

wherein R is hydrogen and Ar is an aromatic radical.

10. The polyimide of Claim 3 wherein the ketone has the formula:

wherein Ar is a substituted aromatic radical and R is a lower alkyl radical of 1-8 carbons.

11. The polyimide of Claim 4 wherein the ketone has the formula:

wherein Ar is an aromatic radical, R is hydrogen and X is -CH2.

12. The polyimide of Claim 5 wherein the ketone has the formula:

wherein R is hydrogen and X oxygen.

13. The polyimide of Claim 6 wherein the ketone has the formula:

wherein R is hydrogen and X is -CH2.

14. The polyimide of Claim 7 wherein the ketone has the formula:

wherein R is an alkyl radical of 1 to 8 carbons and X is -CH₂.

15. The polyimide of Claim 8 wherein the keytone has the formula:

wherein R is hydrogen and Ar is an aromatic radical.

- 16. The polyimide of Claim 1 wherein the dienophile is selected from the group consisting of bismaleimides, trismaleimides, and mixtures of bismaleimides, and/or trismaleimides and maleimides wherein the maleimides range from 0 to about 25 molar percent of the mixture.
- 17. The polyimide of Claim 16 wherein the deinophile is at least one bismaleimide.
- 18. The polyimide of Claim 16 wherein the dienophile is at least one trismaleimide.
- 19. The polyimide of Claim 16 wherein the dienophile is mixtures of bismaleimides, and/or trismaleimides and maleimides.
- 20. The polyimide of Claim 16 wherein the bismaleimide has the formula:

wherein Y is -CH2.